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## CHAPTER 7

# Profitability and Industry Health

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Casting suppliers must cope with volatile and cyclical demands that are driven by the demand for durable goods. High interest rates and under-utilized capacity plagued metalcasters through most of the 1980s. The low level of business and the stagnant prices during this decade reduced the profits available for investing in new equipment and hiring new, skilled workers. As companies focused on survival, new casting applications and process improvements were given low priority. In the early 1990s, falling interest rates, increased casting demand, and the closing of some foundry capacity led to a significant improvement in metalcasting business. Those companies that survived and continued to grow in sales and profits through the late 1980s and early 1990s are more knowledgeable about the importance of education, marketing, and customer relations.

### Current Situation

The total volume of castings produced in the United States exceeds \$20 billion annually. Although the value and tonnage of castings shipped is decreasing relative to economic growth as measured by GDP and FRB's durable goods production index, real growth in the value of castings shipments is expected to increase over 2% annually through the year 2000.

The U.S. is the third-largest producer of metal castings in the world after China and the EC countries collectively; historical data indicate a slow decline in the U.S. share of total world output. For both ferrous and non-ferrous castings, international trade accounts for a very small but growing percentage of the U.S. casting market. The domestic balance of trade in ferrous and non-ferrous castings for major trading partners is shown in Exhibit 7-1.

The U.S. ferrous metal casting industry has seen a considerable decline in aggregate production, overwhelmingly due to a drop in gray iron production. Production of non-ferrous castings (dominated by aluminum castings) is at about the same level it was 30 years ago, having recovered from a steep drop in the late 1970s and early 1980s. Total industry employment decreased by about 20,000 between the late 1980s and early 1990s, although employment levels were up somewhat in 1995. Capacity is currently close to full utilization.

The typical U.S. foundry is a small business; about 80% of operating foundries employ fewer than 100 workers. Small foundries spend a higher proportion of their funds available for capital improvements on pollution control equipment. The industry as a whole, however, invests significantly in new capital. Compared to other manufacturing industries, and with the exception of the steel casting sector, the ferrous sectors of the industry had above-average capital stock (investment in new capital of all types)

<b>Exhibit 7-1. United States Trade Balance for Ferrous and Non-Ferrous Castings - First Two Quarters of 1993 Exports Minus Imports (\$ millions)</b>		
<b>Continent</b>	<b>Ferrous Castings</b>	<b>Non-Ferrous Castings</b>
Other North America (Canada and Mexico)	+51.7	+2.0
European Community	+12.8	-3.3
Asia	-32.3	+2.0
Japan	+1.75	-3.3
Brazil	-7.5	+0.2
<b>WORLD TOTAL</b>	<b>+97.0</b>	<b>+16.5</b>

Source: *Workshop on U.S. Metal Casting Technical Priorities and Strategies*, Rand Critical Technologies Institute, March 1994.

from 1972 to 1987 when measured by the value of assets per employee. New investments in the non-ferrous sectors of the industry were about average compared to other industries.

In the late 1980s, total funding for metalcasting research in the United States amounted to less than \$500,000 per year, and that was supplied entirely by technical societies and trade associations. As of 1992, the U.S. metalcasting industry was receiving approximately \$5 million in funding from various sources, including the Federal government and technical and trade associations. Today, the U.S. metalcasting industry and its technical societies, often working in partnership with government, academia, and its supplier base, have significant research programs in place.

Despite the recent growth in funds for metalcasting-related R&D in this country, the United States lags behind major competing nations in total research dollars spent on metalcasting. In Germany, there are three major foundry research institutes to which the German government provided matching funds to industry for their R&D investments. Metalcasting research institutes in Japan, Brazil, and many European countries receive substantial funding from their governments.

## **Trends and Drivers**

Specific factors that affect the industry's health include interest rates, currency exchange rates, inflation, industry capacity, and tax laws, among others. Total cost will continue to put major pressure on metalcasters. Costs may also result in continued globalization, as casters expand into regions of the world where labor is inexpensive and plentiful. The majority of U.S. metalcasters are small businesses that lack the resources to upgrade their operations, much less fund any technical research and development. Lenders are often reluctant to commit financial resources to basic industries such as metalcasting, which are considered risky investments because of environmental compliance issues and the associated financial liabilities. This creates a "Catch-22" situation -- metalcasters cannot easily obtain financing for new foundries or equipment because the industry is considered insufficiently profitable, yet these capital

investments could substantially increase the industry's profitability, reducing the risk to lending institutions.

Another trend has been the downsizing of many domestic equipment suppliers as a result of the dual forces of increased foreign competition and a contraction of the U.S. metalcasting industry. The research and development budgets of these companies were frequently reduced or eliminated.

New technology spawned by the computer revolution has required a shift from a "cottage industry" to larger capitalization to finance improved efficiencies. This leads to a requirement for new skills for operators, maintenance personnel, engineers, and management. The industry has historically concentrated on volume rather than value; this is gradually changing as casters increase the value added to their products.

Other key challenges to industry profitability facing metalcasters in the near future include the changing demands and needs in the marketplace; tougher domestic and foreign competition; more aggressive marketing efforts by competitive processes and materials; and the growing numbers of environmental, safety, and health regulations and laws. In addition, quality systems like ISO 9000 are becoming critical for successful competition in the world-wide market.

## Performance Targets

Based on its expected health and profitability in the future, the industry would like to increase the financial resources available to fund research and educational and marketing programs by 10%.

## Barriers

As shown in Exhibit 7-2, barriers to increased industry profitability and health are categorized in terms of costs and profits, capital expenditures, R&D expenditures, and markets and marketing. The industry operates in a very price-competitive environment, largely due to its fragmented nature. Low **profits** are a deterrent to recapitalizing the industry. The rate of change in the industry is likely limited by the ability to invest in getting new technologies into use, not the funding to discover new processes or products. A significant challenge will be to recognize the extent to which improved operating efficiency can be leveraged into lower prices for customers without reducing or eliminating profits.

Small foundries seldom have the financial resources or access to credit that is necessary for **capital expenditures** in extensive modernization or even equipment. These foundries cannot achieve economies of scale in some manufacturing functions such as purchasing and marketing. In addition, many cannot afford state-of-the-art technologies (e.g., CAD/CAM/CAE) that would help them compete in the international market. Many metalcasters, particularly smaller ones, are under-capitalized and do not have sufficient capital for investing in new equipment or exploring new applications of metal castings.

A competitive disadvantage is created by purchasing equipment (particularly molding machinery and technology) from foreign suppliers. The same weak dollar that helps U.S. metalcasters export castings makes the capital cost of expansion incrementally more expensive when the equipment and technology are imported. Molding technology that comes with the machinery is developed offshore. The tie to technology is necessary for companies that do not have their own in-house resources to overcome molding and coremaking problems.

<b>Exhibit 7-2. Major Profitability and Industry Health Barriers</b>	
<b>AREA</b>	<b>BARRIERS</b>
<b>Costs and Profits</b>	<p>Price-competitiveness of the environment</p> <p>Low profits are a deterrent to recapitalizing the industry</p> <p>Incorporating improved operating efficiency into lower prices without reducing or eliminating profits</p> <p>Expansion of casting into regions of the world where labor is inexpensive and plentiful</p>
<b>Capital Expenditures</b>	<p>Inability of small foundries to invest in extensive modernization or even equipment retooling</p> <p>Lack of capital for investing in new equipment or exploring new applications of metal castings</p> <p>Purchase of equipment (particularly molding machinery and technology) from foreign suppliers</p> <p>Molding technology that comes with the machinery is developed offshore</p> <p>Many domestic equipment suppliers have reduced or eliminated R&amp;D budgets</p> <p>Compliance with government regulations (particularly environmental) has reduced the earnings available to purchase new technologies, modernize plants, or train workers</p> <p>Product liability costs are much higher in the U.S. than in competing countries</p>
<b>R&amp;D Expenditures</b>	<p>Small financial and human resources of small foundries</p> <p>Lower overhead costs of foreign competitors</p> <p>Low R&amp;D budgets of domestic equipment suppliers</p> <p>A lack of sufficient funding for metalcasting research</p>
<b>Markets/ Marketing</b>	<p>Transition from a sellers' market to a buyers' market</p> <p>Metalcasting operations are becoming more product-driven rather than process-driven</p> <p>Industry's lack of proficiency in generating new markets</p> <p>Competition from other processes and materials</p> <p>Unwillingness or inability of many U.S. companies to pursue international customers</p>

Increased foreign competition and a contraction of the U.S. metalcasting industry has forced many domestic equipment suppliers to reduce or eliminate R&D budgets. This has led to slow technology growth in the domestic equipment supplier industry. The industry contraction has also created a large market of used equipment, which is re-sold in lieu of equipment incorporating the latest technological innovations.

Compliance with government regulations (particularly environmental) has reduced the earnings available to purchase new technologies, modernize plants, or train workers. An estimated \$750 million annually (in addition to the current \$1.25 billion annually) is predicted to be required to bring foundries into compliance with the additional regulations that government is proposing.

A lack of sufficient **funding for metalcasting research** is the largest barrier to getting quality engineers to enter the industry. Small foundries seldom have the financial or human resources to support any research and development programs. Since many foreign competitors obtain more R&D assistance from their governments than U.S. foundries, they enjoy lower overhead costs and can thus offer lower prices for finished products.

Major barriers in **markets and marketing** include the industry's transition from a sellers' market to a buyers' market, its relative lack of proficiency in generating new markets, stiff competition from aggressive competitors (both other processing techniques and other materials), and the unwillingness or inability of many U.S. companies to pursue international customers.

## **Integration with the Technology Roadmap**

The health of the U.S. metalcasting industry continues to be affected by the loss of end-use markets and the substitution of non-cast components, issues addressed in Section 2. Any R&D efforts that result in the development of new markets and products or the recapture of lost markets will therefore have a positive effect on the industry's health and profitability. Similarly, improvements in casting quality, consistency, performance, lead time, and productivity (see Sections 3 and 4) will help maintain and improve the industry's status.

Increases in industry profits will enable the industry to further invest in its future by sponsoring more technical research and development, investing in new technologies and processes, and increasing its educational investments. By reinvesting a portion of its financial gains in these areas, the industry can enhance its competitive position, becoming the preferred supplier of net shape metal components.

Metalcasters of the future will need to be amenable to change to survive. Willingness to change ways of doing business, management techniques, and products and services offered will be important to long-term industry viability. Effective sales and marketing programs, as well as sponsorship of relevant research and development efforts in all aspects of metalcasting, will help the industry secure profitable long-term growth. A more skilled and educated industry workforce (see Section 6) will improve the industry's performance in existing markets while facilitating its entry into new ones. Other changes and developments that would contribute to a healthy industry are shown in Exhibit 7-3.

### Exhibit 7-3. Profitability and Industry Health Needs

Processes/ Technologies	Markets/Marketing	Customers
<p>Lead time reduction from concept to commercial castings through the use of computer-aided design, finite element analysis, casting process simulation, or rapid prototyping techniques</p> <p>Availability of a wider variety of metals, alloys, and metal matrix composites</p> <p>Effective integration and application of new technologies</p> <p>Expanded variety of casting process capabilities</p>	<p>Modern management and marketing techniques</p> <p>Business plan driven by customer product needs, not foundry capabilities.</p> <p>Identification of new geographical markets, new applications, and markets in industries not presently served</p>	<p>More value-added services offered to customers, such as casting design, machining services, chemical impregnation services, etc.</p> <p>Streamlining of all customer-contact procedures to simplify and speed up the process of making casting design changes and purchase order changes</p> <p>Improved communication with casting customers, which can increase a metalcaster's chances for repeat business</p> <p>Recognition by everyone in the foundry, from the chief executive officer to the lowest rated worker, of the importance of customer service and customer satisfaction</p>